Baseline Survey of Lead Levels in Soil
Hopkinton, NH
November 2003

1. Background

In 2002, Bio Energy LLC submitted a request for a significant modification to its air emissions permit to combust construction/demolition derived wood products at its Hopkinton, NH wood-to-energy facility. After careful review and analysis of the submitted information, the New Hampshire Department of Environmental Services (DES) issued a modified air emissions permit to Bio Energy in July 2003. The Bio Energy facility is currently not operating, but after the final permit was issued, some residents of the town of Hopkinton became concerned about the potential health impacts from the release of lead from the storage and combustion of wood containing leaded paint residue.

The allowable amount of lead that can be released is regulated by the state Air Toxics Control Program (RSA 125-I) and its Administrative Rule (Env-A 1400) to assure that the amount of lead from the facility remains below the level at which health effects might occur from breathing the air. However, residents also voiced concern over the potential health impacts of lead that may be released into the air and later deposited on the soil and in the water within the local area. DES currently has no legal authority to regulate such deposition, and we believe that lead deposition will not result in a measurable buildup of lead in the soil or water. However, in order to assure that the impacts of emissions from the facility will not create a public health concern, DES made a decision to conduct a pre- and post-operational soil sampling and analysis program in the Hopkinton area.

DES prepared a *Soil Sampling Protocol* and selected twelve locations within the town of Hopkinton to represent the areas of potential impact of air emissions from the facility. The protocol followed standard EPA guidelines[1], and was approved by DES personnel familiar with soil sampling and analysis, and air emissions deposition. DES collected the baseline sampling on November 18, 2003. Samples were collected as detailed in the *Soil Sampling Protocol*, and were transported under chain-of-custody to the DES analytical laboratory at 29 Hazen Drive for subsequent analysis for metals including lead. This report represents the results obtained from the baseline sampling program.

2. Test Program Description

The soil sampling conducted as part of this study was completed on November 18, 2003 and May 25, 2004. Twelve locations representing areas of predicted maximum deposition, predicted minimum deposition (background), and sensitive areas (local schools) were selected based on wet and dry deposition emissions modeling conducted by DES. One additional sample was also collected from a drainage culvert leading from the Bio Energy facility to the Contoocook River at the request of the Hopkinton Town Administrator. One sample, collected at the junction of Stumpfield and Sugar Hill Roads, was later found to be unrepresentative due to its close proximity to an old foundation hole and debris pile that may have been contaminated with lead-based paint. As a result, DES re-sampled in an adjacent area away from the foundations on May 25, 2004. Following the *Soil Sampling Protocol,* DES personnel visited each location, established a sampling grid, and collected a composite soil sample using pre-cleaned sampling equipment. The composite sample was mixed in a pre-cleaned stainless steel bowl and apportion of the sample was placed into a pre-cleaned, labeled, sample container. The sample collection data sheets were then completed including sampling site description, date and time of sampling, GIS coordinates of the sampling site, and any other pertinent notes. Following collection, all samples were stored in Styrofoam coolers and returned to the DES laboratory under chain-of-custody for subsequent analysis via EPA methods SW 3050, SW 6020,SW 6010 and SW 7174A for trace metals including lead (Pb), mercury (Hg), arsenic (As), cadmium (Cd), total chromium (Cr), zinc (Zn) and

[1] Environmental Response Team. Standard Operating Procedure 2012, soil Sampling. US EPA, February 18, 2000.

manganese (Mn).

3. Summary and Discussion of Results

Results of the baseline soil sampling by location are presented in Table 1. The locations and results for soil lead levels are depicted in Figure 1. Although there are no applicable standards for acceptable levels of lead and other metals in residential soils in NH, the DES Waste Management Division has established background concentration values for some metals in New Hampshire soils. These values are presented in the *New Hampshire Risk Characterization and Management Policy* (RCMP) and represent the 95th percentile of data contained in:

1) Appendix A of the *NH DHHS Preliminary Survey of Metal Concentrations in New Hampshire Soils*, Final Report, May 1991; and

2) Background data (i.e., before sludge spreading) collected for the sludge application program prior to 10/23/1997.

These background levels of metals in New Hampshire soils are presented in Table 2.

As indicated, the mean and median measured soil lead levels (24.5 mg/kg and 13.8 mg/kg respectively) were well below the background level presented in the RCMP (51.0 mg/kg). In addition, the lead levels found in the collected samples ranged from less than 10 mg/kg to 72.9 mg/kg; well within expected range for background soil lead levels. The lead level measured in one sample, collected near the junction of Stumpfield Road and Sugar Hill Road, was considered an outlier, and was therefore not included in this analysis. Comments on the sample collection data sheet for this sample noted that it was collected immediately adjacent to two old, abandoned stone building foundations. This indicates the possibility of localized impacts from a site-specific source such remnants of lead-based paint associated with the structures previously located on the site. As a result, DES re-sampled in this area away from the foundations on May 25, 2004.

Table 1 Hopkinton Baseline Soil Sampling Results - 11/18/03

Site Location	Lead (Pb) (mg/kg)	Mercury (Hg) (mg/kg)	Arsenic (As) (mg/kg)	Cadmium (Cd) (mg/kg)	Total Chromium (Cr) (mg/kg)	Zinc (Zn) (mg/kg)	Manganese (Mn) (mg/kg)
Harold Martin School	14.9	<0.15	2.4	<1.5	5.9	23	171
Maple Street School	13.8	<0.15	2.5	<1.5	7.8	33.4	104
Elm Brook Park	54.2	<0.15	3.9	<1.5	10.0	44.5	155
Jct of Stumpfield & Sugar Hill Rd	void	void	void	void	void	void	void
Corner of Hatfield & Moran St	<10	<0.15	3.7	<1.5	11.4	42.2	161
Spring Hill Road	<10	<0.15	2.2	<1.5	8.87	18.9	46
Bus Parking near Bio-Energy	39.5	<0.15	4.9	<1.5	12.1	104	200
Drainage Ditch near Bio-Energy	72.9	<0.15	14	<1.5	15.8	282	139
Dodge Hill Rd	11.4	<0.15	5.4	<1.5	13.6	54.1	154
Rt 202W & Stumpfield Rd	12.4	<0.15	2.5	<1.5	14.4	25.9	60
Hatfield Rd (just off 202)	<10	<0.15	2.5	<1.5	18.0	30.4	165
Junction Rt 202 & Rt 9	20.4	<0.15	3.0	<1.5	11.0	31.3	114
Upper Sugar Hill Road	25.0	<0.10	NA	NA	NA	NA	NA

Further comparisons of current lead levels with those from previous soil sampling at the Maple Street School were also made. NH DHHS conducted soil sampling at the Maple Street School in 1991

as part of the *NH DHHS Preliminary Survey of Metal Concentrations in New Hampshire Soils*. These results are provided in Table 3. As shown, the levels of metals, including lead, are all similar to those collected in 1991, indicating no significant change over the past 12 years.

Table 2
Background Concentrations of Metals in Soil
NHDES Risk Characterization and Management Policy (Subsection 1.5(4)(c))

METAL	BACKGROUND SOIL CONCENTRATION (mg/kg)
Arsenic	11
Cadmium	1.9
Chromium	33
Mercury	0.31
Lead	51

Source: 95th percentile of data contained in 1) Appendix A of the NH DHHS Preliminary Survey of Metal Concentrations in New Hampshire Soils, Final Report@, May 1991 and 2) the background data (i.e., before sludge spreading) collected for the sludge application program prior to 10/23/1997.

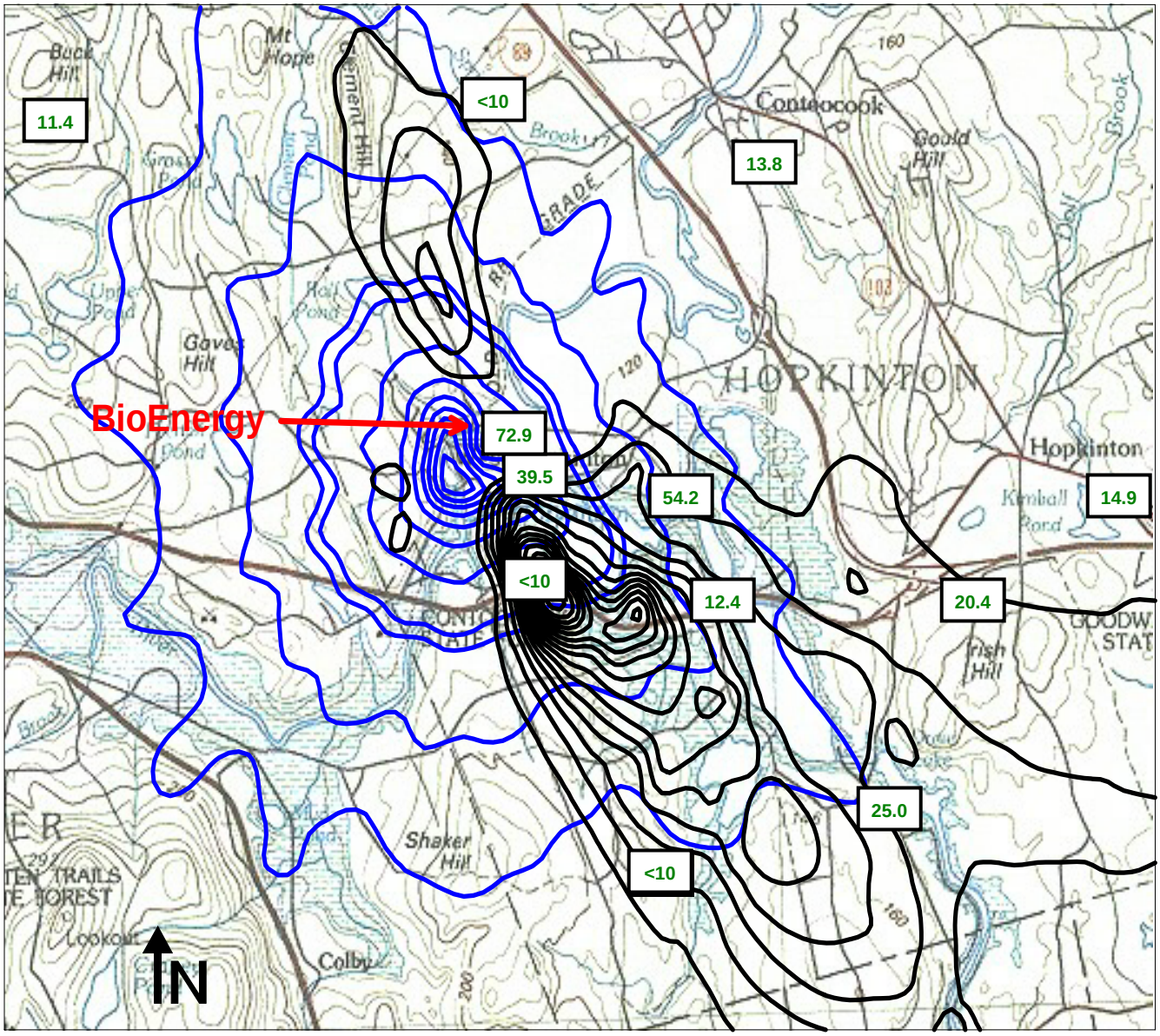
Table 3
Comparison of Measured Metals Concentration in Soil
Maple Street School, Hopkinton, NH

METAL	SOIL CONCENTRATION 1991[1] (mg/kg)	SOIL CONCENTRATION 2003 (mg/kg)
Arsenic	2.0	2.5
Cadmium	0.25	<1.5
Chromium	22	7.8
Mercury	0.030	<0.15
Lead	12	13.8

[1] *NH DHHS Preliminary Survey of Metal Concentrations in New Hampshire Soils*, Final Report, May 1991.

Figure 1

BioEnergy Facility - Hopkinton, NH
Distribution of Annual Lead Deposition Impacts



New Hampshire Department of Environmental Services